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BARK BEETLE CONTROL

A REPORT PREPARED BY THE FORESTRY DIVISION

of the

LOS ANGELES COUNTY DEPARTMENT OF FORESTER

AND FIRE WARDEN

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BARK BEETLE CONTROL

BIG PINES PARK

April 22 - May 23, 1940.

Owing to a combination of circumstances coniferous trees in Swartout Valley have, over a period of years, been subjected to increasingly severe attacks by various insects of the super family scolytoidea (bark and ambrosia beetles). In the spring of 1940, perhaps due to lack of freezing winter weather, the number of beetle trees assumed epidemic proportions.

An appropriation was made, from funds remaining from the first quarter salaries and wages budget, sufficient to employ a crew of eight temporary men for twenty-two working days at insect control on the 747 acres of County owned land at Big Pines. On approval of Chief Assistant Davis this crew was augmented by twelve days work by a skilled climber and topper regularly employed on one of the P.T. & M. crews. A thorough inspection of the area was made by Forestry Division personnel and all beetle breeding trees marked. These were felled by Park personnel, or in case the lower parts of the trees could be saved, were topped by the P.T.& M. climber. Insects in the resulting debris were then destroyed by the temporary crew by barking, burning, and in some cases burying the infested material. Windfalls and woodpiles breeding beetles were cleaned up by burning or barking. The park management cooperated effectively by furnishing truckage and a fire pumper with operator whenever needed.

For identification of all species mentioned in this report, and for material assistance in the preliminary survey of insect conditions in the Big Pines area, we are indebted to Mr. Charles R. Bruck, formerly of the University of California and of this Department.

Control work was confined to two species of trees, Abies concolor (white fir) and Pinus jeffreyi (Jeffrey pine); however, sugar pine, ponderosa pine, incense cedar, pinyon, black oak, mountain mahogany, bitter cherry and Fremontia were also being somewhat damaged by scolytid species peculiar to those trees.

Following is an account of the amount and nature of work accomplished, listed by types of activity found necessary for effective beetle eradication.

Felling: 116 trees consisting of 63 fir and 53 pine ranging from saplings to mature trees were felled; in addition 29 trees felled previously were inspected and treated if deleterious insects were in evidence.

Topping: 80 large trees, 44 fir and 36 pine were topped, or infested upper branches were removed. The tops were disposed of by carrying out to roads or trails where they could be picked up and hauled to safe burning sites; isolated tops in remote places were chopped up and buried deeply enough to prevent emergence of the beetles. Many large trees climbed proved to be suffering from other than bark beetle damage. From such trees

eight girdling aerial wires, apparently erected by campers, were removed and eighteen caterpillar nests destroyed. Damage by flea beetles and leaf hoppers in some cases could not be distinguished from scolytid work until the tree was climbed.

Limbing: 81 of the larger trees felled were limbed. If subject to infestation the limbs were burned; if past the beetle breeding stage they were salvaged for wood. Smaller trees were burned whole,which saved the labor of limbing.

Barking: 71 large trees were barked; pine limbs over six inches in diameter were barked as this involved less labor and hazard than burning such heavy wood. Tools found suitable for use in barking included Pulaskis, wrecking bars and axes, but the best tool tried was a four foot piece of three-fourths inch drill steel sharpened to a one and one-half inch chisel bit at one end. A (D) handle mounted on the other end would have made this tool all that could be desired. Bark from trees in which all beetles were still in the larval stage between bark and wood was not burned, as exposure to the air was found to very quickly kill the larvae of species encountered at Big Pines. (In areas where Dendroctonus is present it would be necessary to burn all bark as the larvae of many species of this genus live entirely in the bark.) Bark from trees in which the larvae had matured and left the cambium, or in which pupation had taken place, was carefully gathered up and burned.

Windfalls: 43 large windbroken branches and many small ones were collected and burned. Windfalls provide an ideal place for many species of beetles to breed until they attain sufficient numbers to successfully attack living trees.

Woodpiles: 8 woodpiles were inspected and infested material barked or burned. Hauling of unbarked firewood from place to place has been one of the chief factors in the spread of bark beetle infestations. In fact, where lightning trees, windfalls, etc., are not disturbed it seems that natural enemies usually keep the scolytids pretty well under control, but when the infested material is transported to a new location the parasites and predators are often left behind, and the bark beetles emerge unhindered to destroy surrounding trees.

Burning: 53 piles of infested limbs and bark were burned. In cases where burning could not be done in situ the material was hauled to safe burning sites. Wherever possible the fire pumper stood by during burning operations; in other cases hose was laid from the nearest hydrant. Unfortunately, early morning burning could not be resorted to because the smoke interfered with the morning observations of the Smithsonian Institute's solar observatory on Table Mountain.

Inspection: Practically every tree on the 747 acres of County-owned land was examined for beetles, and trees on adjoining areas were carefully observed. In advanced stages of beetle attack the trees or tops are a bright

brown color readily distinguishable by anyone; however, in earlier stages, especially in attacks by Pityophthorus or Pityokteines, the foliage often dries up so quickly that its green color is retained as in dried hay. In fallen branches, logs, woodpiles, etc., small piles of sawdust in crevices of the bark are certain evidence of bark or ambrosia beetle work. Even on standing trees sawdust sprinkled down over the bark often gives indication of scolytid attack before any change in color of foliage can be detected. Of course the final proof is the presence of the engravings made by these beetles between the bark and the wood. A good pair of binoculars, adequate climbing equipment, a pocket knife and hand axe, are essential in surveying for bark beetles.

The true bark beetles of the family scolytidae differ from other boring insects in that the adults drill through the bark and then make more or less extensive galleries in the cambium in which to deposit eggs. The grubs hatching from these eggs work out at approximately right angles from the egg tunnels until fully grown, when they pupate; then gnaw out through the bark and fly away to make egg galleries in adjacent trees. The number of generations per annum varies with different species and climatic conditions but averages three per year in southern California. The pattern formed under the bark by the egg and larval tunnels of each species is different and once learned these patterns are the easiest means of bark beetle identification. The Ambrosia beetle branch of the family excavates egg tunnels into the wood itself. They are unique in being the only beetles that give care to their young, which they feed from carefully tended plantations of ambrosia fungus. Ambrosia beetles, with a few exceptions, (Dutch elm beetles) are of only secondary interest to the forester, but are a source of great loss to the lumber industry. Many other wood boring insects, including buprestids, cerambycids, wood moths, sawflies, etc., lay their eggs on the surface of the trees or insert them in cuts made with an ovipositor.

Species of scolytid beetles found to be primary causes of death of Jeffrey Pine in the Big Pines area, either alone or by simultaneous attack of several of the species, or by the beetles augmenting other deleterious conditions that by themselves would not have proven fatal to the tree, are as follows:

Pityophthorus hopkinsi Blkm. A slender minute species 1/16" in length, mines the twigs under the base of the needles and even works in the sheaths of the needle bundles. Type of work is stellate but the cambium layer of the twigs is usually so completely riddled that it is impossible to distinguish individual tunnels. This species, or its previous work, was found in over 90% of the dying and dead Jeffrey pine inspected. It apparently attacks perfectly healthy trees without the slightest hesitation, and when present in sufficient numbers causes drying of the foliage so quickly that all of its green color is not immediately lost. The typical bright brown color appears in the foliage about the time species of Ips have entered the trunk and branches, which in the past resulted in these more easily noticed insects being blamed for the death of the trees.

Pityophthorus scalptor Blkm. A shining dark brown species 1/8" in length attacking live twigs and branches from the needle covered portion up to a diameter of about two inches. Found attacking live trees practically simultaneously with P. hopkinsi; very prevalent in fresh wind broken branches. Work stellate. Were or had been present in about 80% of all dead and dying pines.

Pityogenos carinulatus (Lec.) Dark reddish brown; females 1/8" in length; more robust than Pityophthorus scalptor which they superficially resemble; males slightly larger with two curved spines on declivity; polygamous. Found in twigs and branches from 3/8" to 3" in diameter in practically all trees attacked by Pityophthorus, and in all windfall material. Although most authorities claim that this insect cannot be considered primary it was found entering healthy trees in locations where large numbers were emerging from nearby infested material.

Ips oregoni (Eich.) A robust species 3/16" long, jet black when fully mature, having the scooped out spine margined declivity typical of the genus. Egg galleries are of tuning fork type. Found in great numbers in the larger branches and trunks of all wind-thrown and dying Jeffrey pine. In a few cases Ips oregoni had apparently attacked the trees simultaneously with Pityophthorus and Pityogenos, but in many cases Ips did not enter the trees until after they were felled on account of Pityophthorus and Pityogenos infestation.

Dendroctonus valens (Lec.) The red turpentine beetle is one of the largest scolytids occurring in western North America, always bright reddish tan or reddish brown in color. It makes irregular longitudinal egg tunnels in the bases of pines and extending along the larger roots. The larvae do not make separate tunnels but work out from the egg tunnels en masse devouring all the inner bark as they go. This species was found in only two trees at Big Pines, both these trees were at the same time infested with Pityophthorus, Pityogenos, Hylurgops subcostulatus, and Ips oregoni. Both trees had suffered injury at the base through human activities. The notorious western pine beetle Dendroctonus brevicomis was not encountered in the Swartout Valley but was found during the same period at Barley Flats and Mt.Gleason. This "worst of all" scolytid drills long serpentine egg tunnels in the inner bark of Jeffrey and Ponderosa pine and the larvae work in the bark. In control of both the above species burning of the bark is essential, as the larvae may complete their entire development embedded in the bark where sun and air cannot get at them even when the bark is peeled and spread.

In addition to the primary species of scolytids listed above many other insects were observed on Jeffrey pine. Leaf hoppers and flea beetles were so numerous during the summer and fall of 1939 as to cause extensive paling of the foliage of pines of all ages over large areas. These pests probably weakened many trees to a point where scolytids could attack with success. Flathead borers of several genera were found, including Chalcophora, Melanophila, Buprestis, and Chrysobothrys. Among round head borers were species of Prionus, Stenocorus, Monochamus, and Graphisurus. Both flatheads and roundheads all appeared to be entirely secondary in the Jeffrey pine, as

did the following species of scolytids: Hylurgops subcostulatus, Ips confusus and latidens, Carphoborus swainei, Pityogenes fossifrons, and Orthotomicus ornatus. Hylastes macer, a root working scolytid, was observed flying in great numbers but was not actually taken from any trees.

No beetle infested Sugar pine was encountered on County property, but from Sugar pine on adjoining tracts the following species of scolytids were taken: Ips latidens, Carphoborus vandykei, Pityogenes knechteli, and several species of Pityophthorus. Three species of scolytids were found to be primary killers of White Fir in the Big Pines region.

Scolytus ventralis (Lec.) The White Fir Engraver, often called The Fir Tree Destroyer, 5/32" long, robust, posterior end of abdomen very concave, as is typical of this genus. Attacks perfectly healthy trees. The trees often manage to "pitch out" the first of the attacking hordes and partially heal over the injuries, but unless the material in which the insects are breeding is destroyed, the trees will finally succumb. The transverse egg galleries are excavated in all parts of the trunks and in branches as small as one half inch in diameter. This species was present in 90% of the firs felled for beetle control at Big Pines.

Scolytus subscaber (Lec.) Very similar to Scolytus ventralis in appearance, but makes horseshoe shaped egg galleries 1/2" across in weakened limbs and oppressed trees. The work of this beetle was found in only two of the fir cut at Big Pines, but a considerable amount of their engravings were observed on material that had been killed in former years.

Pityokteines minutus (Sw.) 1/16" to 3/32" long. Constructs radiate egg galleries forming a very ornamental interlaced pattern under all the smooth barked portion of the white firs. This pest is responsible for the dead topped condition of 50% of the Abies concolor at Big Pines, and was found to have completely killed fir up to a foot in diameter without aid from Scolytus. In many cases fir injured by Scolytus ventralis one season were killed by Pityoktoines minutus the next. This scolytid attacked all the fir tops that had been defoliated by caterpillars in the early spring. The identity of these caterpillars has not been learned, but they are probably of the Tiger Moth group.

An unidentified buprestid (flat head borer) was found to attack live white fir. It seems that the eggs hatch in the summer and the larvae work through the inner bark four or five inches during the fall and winter and then are "pitched out" when spring growth begins. In some trees this process had apparently been repeated year after year until the tree finally succumbed or was killed by bark bettles.

Pseudohylesinus granulatus (Lec.) A secondary scolytid of mottled color, slightly over 1/8" long; found in approximately 50% of the dead and dying fir examined. Its engravings are almost identical with those made by Scolytus ventralis, but Pseudohylesinus does not start its work until about the time Scolytus is in the pupal stage. One fir injured by buprestids was apparently finished off by Pseudohylesinus without aid from

Scolytus or Pityokteines.

Among secondary insects found in all dead and dying fir were Wilson's wide headed ambrosia beetle, round head borers of the tribe Asemini, and several species of flat head borers.

Beneficial insects observed preying on bark beetles included the predators Temnochila virescens, Enoclerus sphegeus and lecontei; and several species of hymenopterous parasites. These latter were destroying about 25% of the larvae of Scolytus ventralis. In some cases mold spreading under the bark had killed great numbers of larvae and pupae, but unfortunately those destroyed in this manner were mostly of secondary species.

The following plates illustrate the types of engravings made by the more important bark beetles encountered at Big Pines, and indicate the portions of the trees usually attacked by each species of beetle.

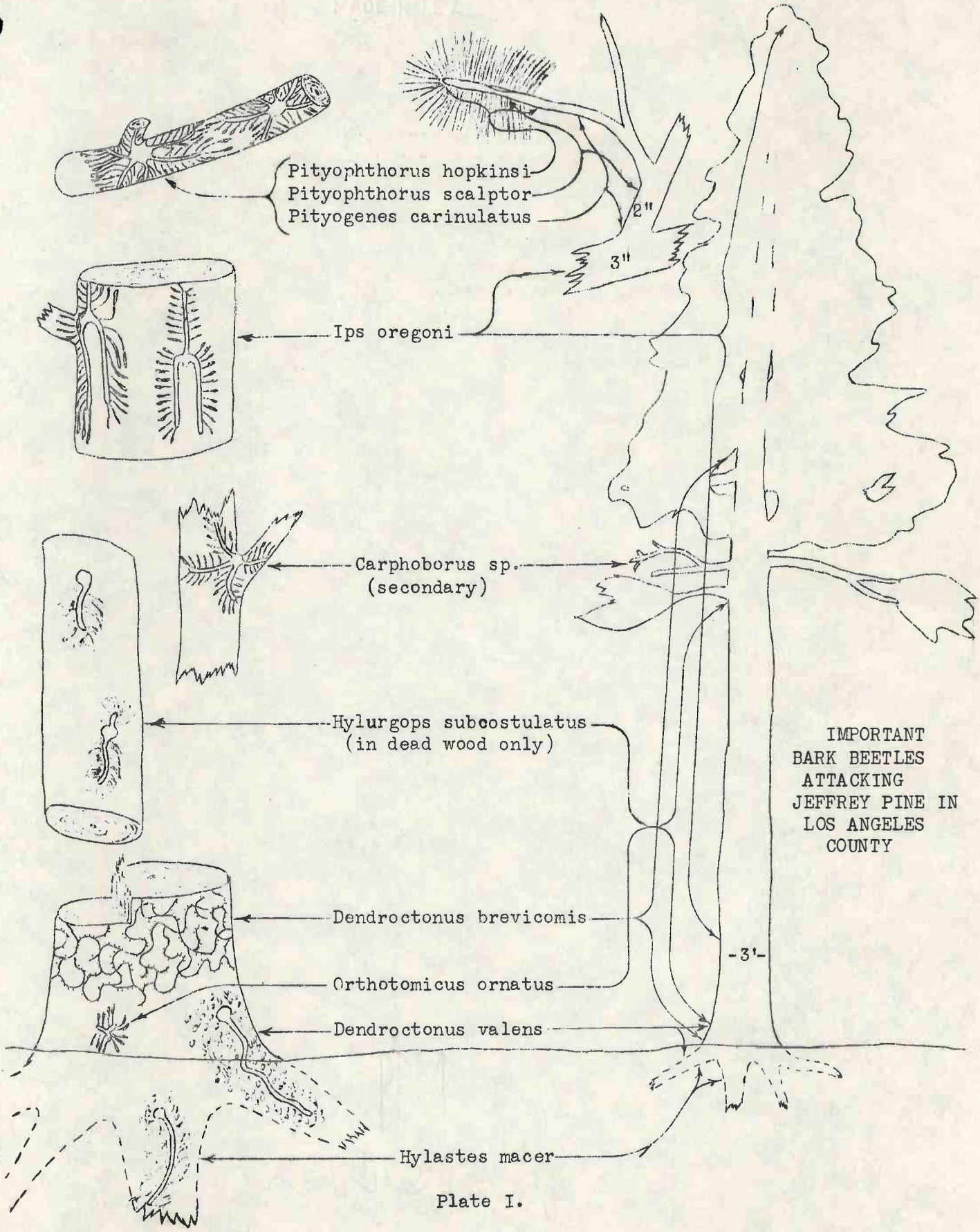
July 5, 1940

AVERIL J. BARTON
Forester GR.II

Approved by CARL O. GERHARDY
Forester, GR.IV
In charge, Forestry Division.

Type of Work

Parts of Tree Attacked



IMPORTANT BARK BEETLES ATTACKING JEFFREY PINE IN LOS ANGELES COUNTY

Plate I.

IMPORTANT BARK BEETLES ATTACKING
WHITE FIR IN LOS ANGELES COUNTY.

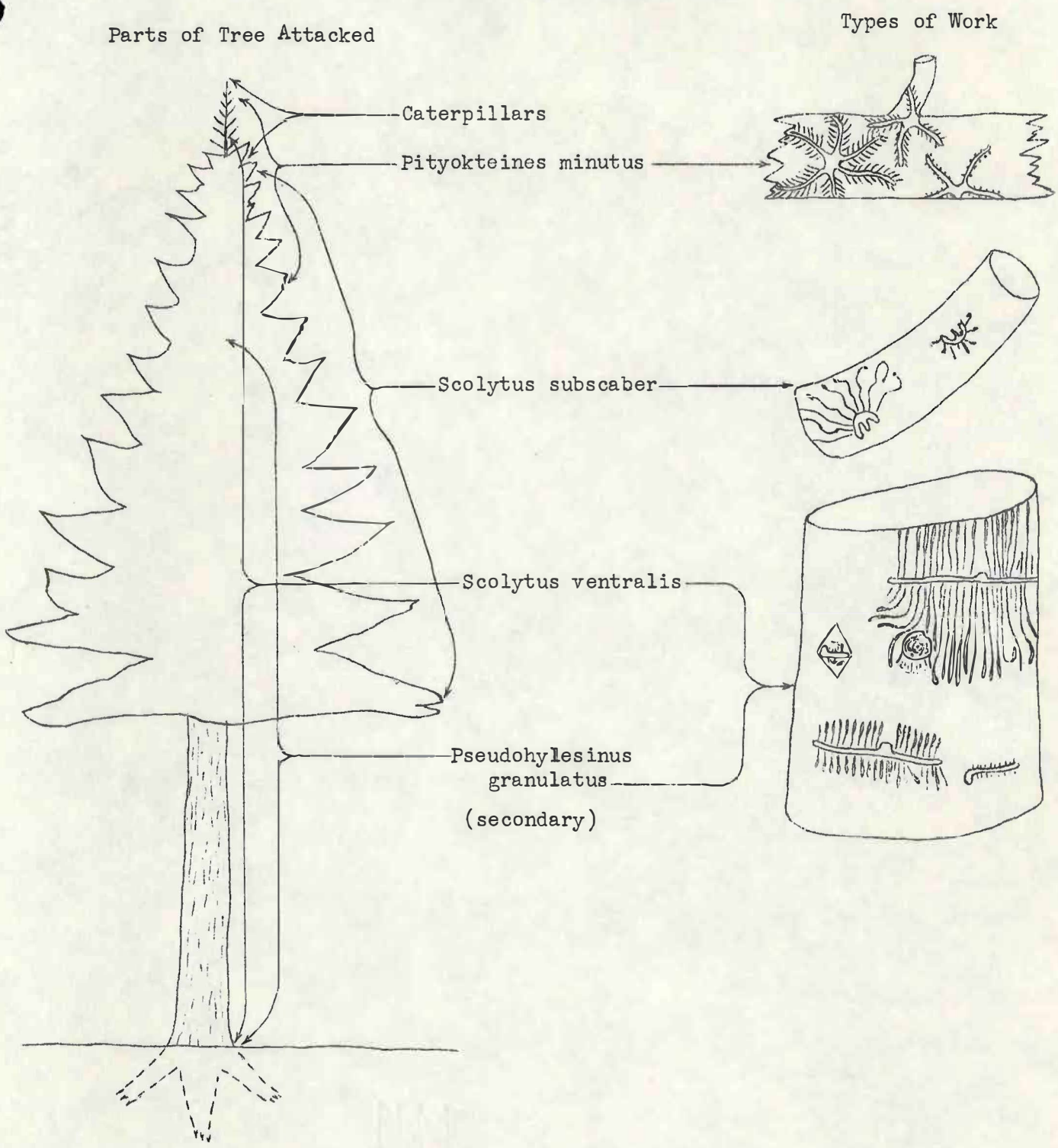


Plate II.